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(71) Applicant(s)

Dunlop Slazenger Group Limited
(Incorporated in the United Kingdom)
Maxfli Court, Riverside Way, CAMBERLEY, Surrey,
GU15 3YL, United Kingdom

(72) Inventor(s)

Robert Marek Chojnacki
Adrian Berry
David Hilary Powell

(74) Agent and/or Address for Service

Hasektine Lake & Co
Imperial House, 15-19 Kingsway, LONDON,
WC2B 6UD, United Kingdom

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(54) Abstract Title

Mounting weights on games rackets

(57) A games racket (especially, a tennis racket) has a head (10) formed with recesses (1) at predetermined points around it for accommodating detachable weights (4). The weights (4) are preferably provided in pairs linked by a flexible strap (5) and fitted into recesses on opposite sides of the head relative to the racket strings. The pairs of weights with straps can be integrally formed by injection moulding and may encase metal cores for increased weight. By providing weights of different values, the balance characteristics of the racket can be adjusted.

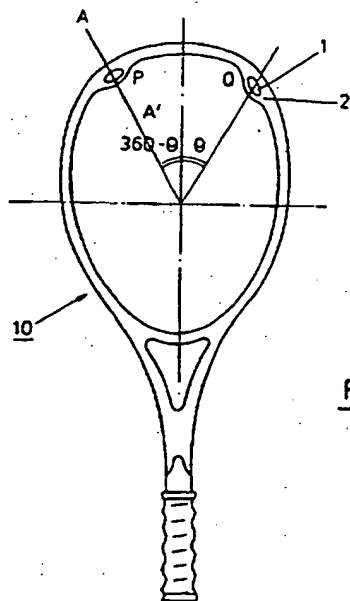


FIG. 1

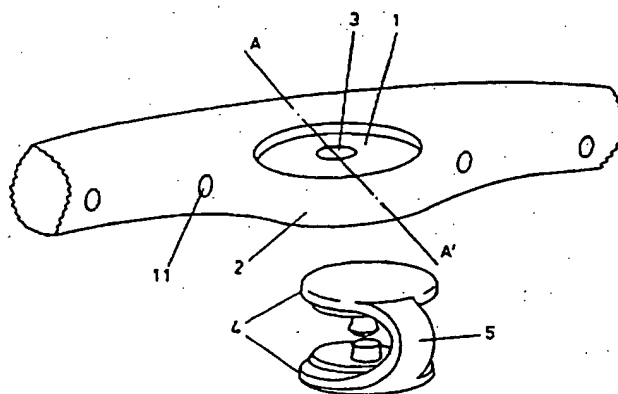


FIG. 3

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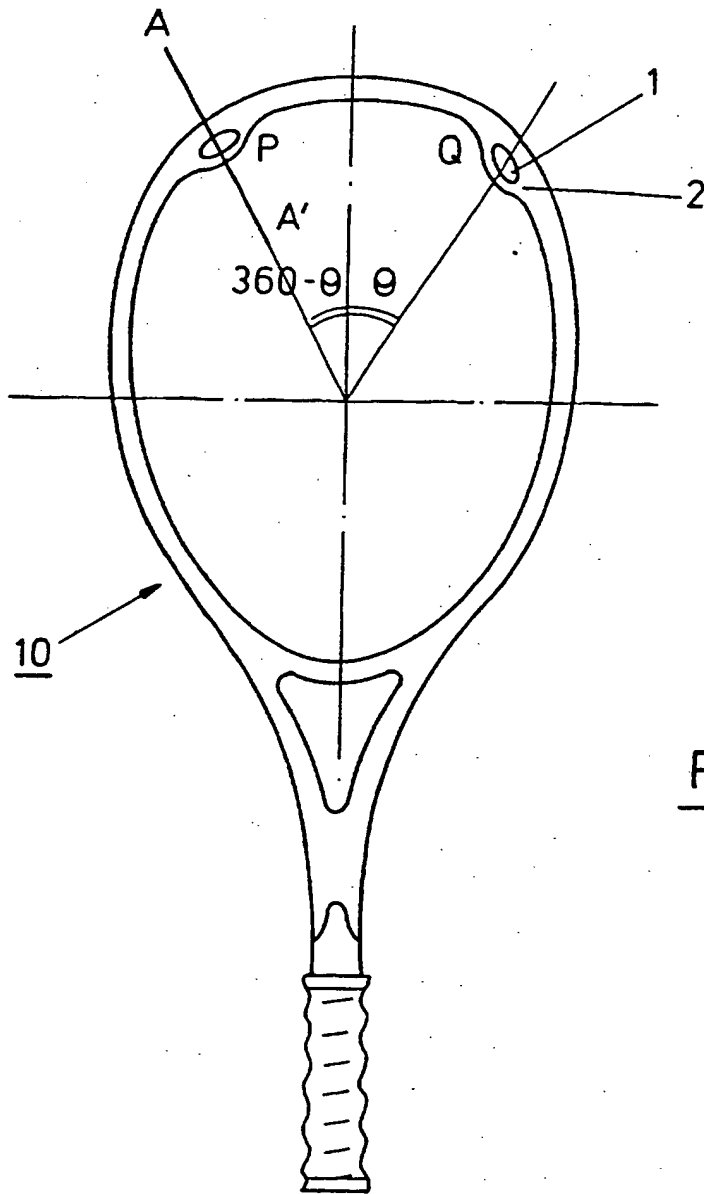


FIG. 1

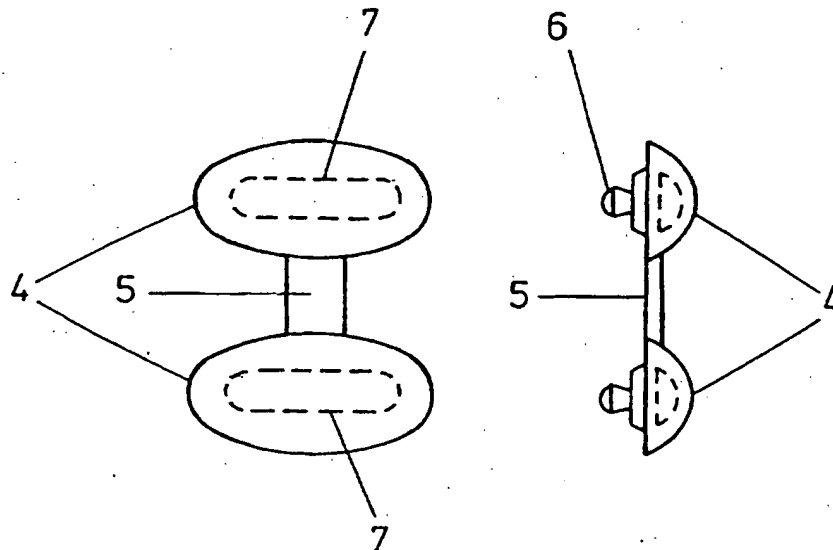
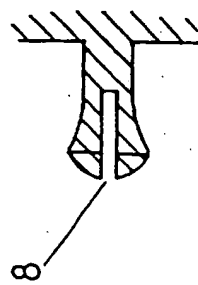
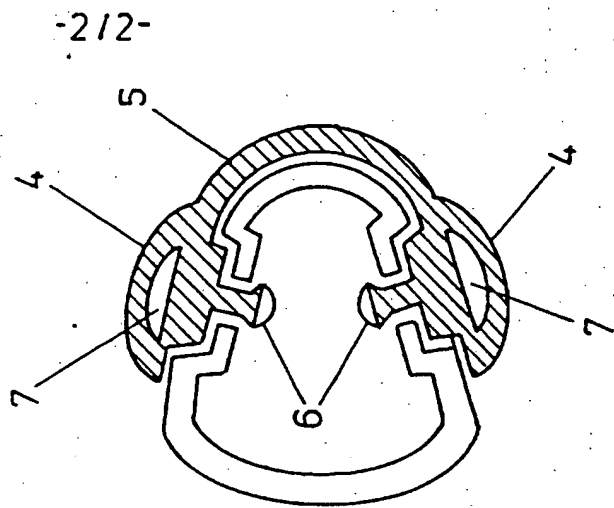
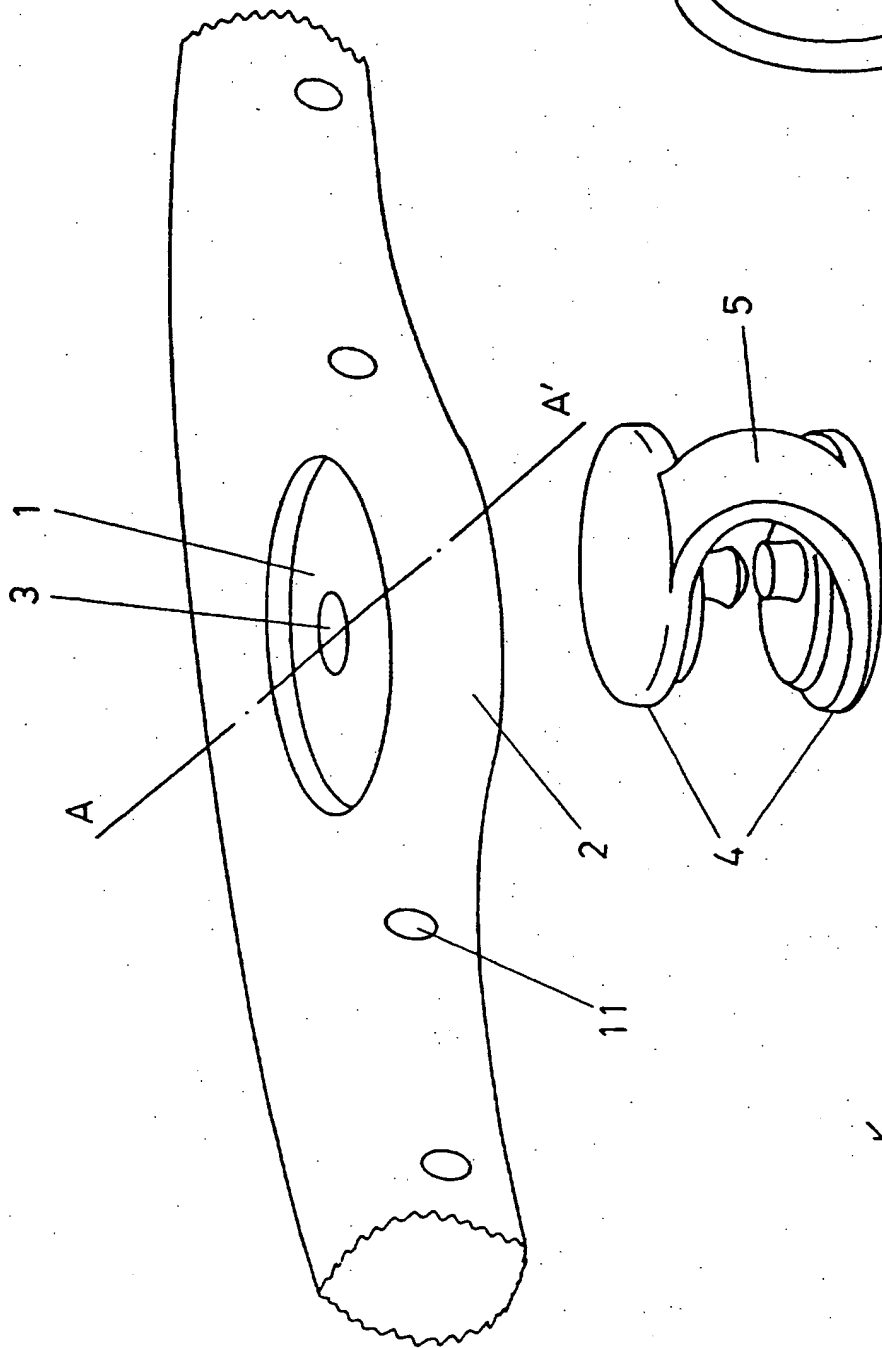


FIG. 2



IMPROVED GAMES RACKET

)
The present invention relates to rackets used for
5 playing games such as tennis, badminton, squash and
similar games, and has particular (but not exclusive)
application to tennis rackets.

The game of tennis has been played for well over
one hundred years. The original rackets were made from
10 sticks of wood bent and glued into the familiar keyhole
shape comprising an essentially ovoid head (containing
the interlaced strings) and a single integral shaft
incorporating a gripping area, usually covered with
leather or like material to enhance gripping qualities.
15 Later, some rackets were made from tubular metal, again
bent into a keyhole shape but in this case it was found
to be more convenient to form the racket frame of an
ovoid head and twin shafts with a 'bridge' across the
shafts to complete the ovoid head and the twin shafts
20 consolidated together and appropriately profiled in the
gripping area.

Initially, due to limitations of the density and
strength of wood, racket frames developed to become of
essentially standardised dimensions and correspondingly
25 similar weight. Because of the variable nature of
wood, being a natural material, players had a
restricted choice of weight and "balance" for their
preferred racket. "Balance" can be defined in terms of
the moment of the racket's weight about an axis in the
30 grip area, about which a racket is considered to rotate
(in certain strokes) in play.

In recent years, the development of new, stronger
and lighter materials based on carbon fibre composites
together with associated manufacturing processes for
35 producing racket frames has removed previous
limitations on racket weight and balance and so

) significant changes in weight and balance are now possible.

According to the present invention, there is provided a games racket comprising: a frame member
5 having a head of generally annular shape, and a plurality of weighting members detachably fitted to the head, wherein the head is provided with mounting means for the weighting members at each of a plurality of predetermined points around its circumference.

10 Preferably, the mounting means comprise recesses in the head which are shaped to accommodate the weighting members, in particular, moulded into a portion of the racket head having an enlarged section.

15 In addition, or instead, the weighting members may each be provided with a projection which fits into a corresponding hole in the racket head. Such a projection may be a stud of resilient material shaped for locking engagement with the hole in the racket head.

20 In a preferred embodiment of the invention, the weighting members are fitted to the head in pairs, the weighting members of each pair being located at corresponding points at either side of a net of strings carried by the head.

25 Conveniently, the weighting members of each pair are joined together, for example by a flexible strap. The pair of weighting members including the flexible strap preferably comprise an integrally-formed body.

30 A preferred way of forming the pair of weighting members including the flexible strap is by injection moulding of polymeric material.

The weighting members may comprise a core of high density material (e.g. metal), and such a core may be encased in polymeric material.

35 The present invention also embraces a weighting member for use in the above games racket.

Thus, the present invention makes it possible, by using standardised component parts which can be easily assembled together, to provide rackets of widely ranging weight and balance at the point of sale. This avoids the necessity for large inventories of different rackets to be held with consequent financial economy.

Reference will now be made, by way of example only, to the accompanying drawings in which:

Figure 1 shows a plan view of a tennis racket embodying the present invention;

Figure 2 shows plan and end views of a pair of weights used in an embodiment of the present invention;

Figure 3 is a detailed perspective view of a recess provided in the frame of the racket of Figure 1 along with a pair of weights as shown in Figure 2;

Figure 4 is a sectional view through the frame in Figure 3 showing the weights attached; and

Figure 5 is a sectional view of a modified version of a stud provided on the weights.

In accordance with the invention, a racket frame consists essentially of the following components:- a frame member having a head, and weighting members.

These components will now be explained in more detail with reference to the embodiment of the invention depicted in Figures 1 to 5.

The weighting members 4 may be attached to the head 10 of the basic frame structure at a variety of positions, but it is found best to attach them at points on the head equal distances on either side of and mirrored in a plane passing through the axis of the racket which is perpendicular to the plane of the strings.

The points may be described in terms of the angular position of, for instance, a compass rose centred on the mid-point of the racket head such that due north points to the crown of the head. Mirrored

points would be θ degrees and $360-\theta$ degrees, where θ varies between 20 and 60 degrees. In other words, the mounting means are located at points on the head at angles of θ and $(360-\theta)$ degrees made in the plane of the strings by a radius from the centre point of the head relative to a line through the centre line (axis) of the shaft and the crown, and measured from the crown, where θ has a value between 20 and 60 degrees. In the example shown in Fig. 1, $\theta = 36$ degrees.

It will be appreciated that while the frame and weighting members are made in a factory, it is the intention that assembly of the components into a completed racket frame will take place where special skills are not available (for example in a shop) and so the components must be designed for easy assembly.

In this embodiment, the weighting members are attached by fitting them into special recesses 1 moulded into an enlarged section of the racket head. To meet the requirements of point of sale fitment, the weighting members should preferably fulfil the following requirements:-

- * to provide a series of different weight values
- * to be capable of easy fitment and removal
- * to be capable of being firmly located in position
- * not to rattle or vibrate when a ball is struck
- * to be unobtrusive and not impinge significantly on the ball striking area of the racket head.

To meet these requirements, in the illustrated embodiment the racket frame and weighting members have the following features:

- (a) Each weighting member is fitted into the structure of the head 10 of the frame by inserting it

into a recess 1. At each part of the head 10 at which
recesses are located, the frame is shaped to form a
portion 2 which is locally increased in cross-section
(i.e., bulges inwards towards the racket strings) both
to accommodate the weighting member(s) and to
counteract the weakening effect of the preferred method
of attachment. This is by means of a stud 6 provided
on each weighting member which fits into a
corresponding location hole 3 in the floor of its
respective recess 1.

(b) At the desired weighting positions (positions
P and Q in the example of Figure 1), the present
embodiment employs two small weighting members rather
than one larger one. The two small weighting members 4
are positioned on opposite sides of the plane of the
racket strings so that encroachment into the ball
striking area is minimised which might otherwise be the
case if a larger single one were used. (Incidentally,
the racket strings are not shown in the Figures but
Figure 3 shows string holes 11 in the racket frame).

(c) For ease of handling, the two small weighting
members are joined together with a strap 5 as shown in
Figure 2. The strap is flexible enough to be bent into
a "U"-shape (as in Figure 3) so as to allow the weights
to be fitted in corresponding recesses on opposite
sides of the frame. This is best illustrated in Figure
4, which is a cross-section along the line AA' in
Figure 3. Preferably, as shown in Figure 4, the strap
fits closely around the profile of the head at its
enlarged portion 2. A pair of weighting members 4
linked by a strap 5 will be referred to below as a
"weighting member/strap system".

(d) To provide easy, positive and firm fitment a
stud 6 is provided on each weighting member and this is
pressed into the above-mentioned location hole 3 in the
recessed part of the frame. The stud is made of

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"weighting member/strap system".

(d) To provide easy, positive and firm fitment a
stud 6 is provided on each weighting member and this is
pressed into the above-mentioned location hole 3 in the
recessed part of the frame. The stud is made of

elastic material such that when it is pressed into its location hole (which is of smaller diameter than the diameter of the head of the stud), it becomes reduced in diameter but then recovers its initial diameter so becoming locked in position.

More particularly, in this embodiment, the stud 6 along with the strap 5 and at least the outer covering of the weighting members, are made of a flexible polymeric material which has essentially elastic qualities such that the enlarged tip of the stud deforms and recovers on pushing it into its location hole. In an alternative design of stud shown in Fig. 5 the stud may be partially cleft in a plane along its axis as indicated by reference numeral 8 in the Figure. This allows easy distortion and recovery of the stud as it is pressed into its location hole.

Meanwhile, the elastic nature of the material allows the strap to be slightly tensioned when the weights are in place and this eliminates any free movement of the weighting members in their recesses which might otherwise occur. In addition, the elastic nature of the weighting members themselves effectively inhibits any tendency for them to rattle as a ball is struck.

Suitable materials for the weighting member/strap system include vulcanisable rubber compounds, so called thermoplastic rubbers (e.g. ethylene-vinyl-acetate) and certain semi-elastic thermoplastics (particularly those based on polyamide such as nylon). These materials are not to be regarded as limiting and other suitable materials will be apparent to those skilled in the art.

So that different values of weight can be provided within a standardised geometric envelope, each weighting member 4 may contain a core 7 as shown in Figure 4 and as indicated by dashed lines in Figure 2. This is preferably completely or near-completely

enclosed in the flexible polymeric material used for the rest of the weighting member/strap system, which material thus constitutes, in this case, a resilient outer covering of the core. The core 7 is thereby
5 securely encased preventing it from becoming loose. The core can be of any suitable shape, such as rectangular or ellipsoid for enabling a compact weighting member to be achieved, and for the same reason is made of a high density material, e.g. a
10 metal. The overall weight can then be varied by varying the weight of the core by using, for instance, metals of different densities such as zinc, copper, lead and tungsten where these have densities of 7.1, 8.93, 11.34 and 19.30 grams per cubic centimetre
15 respectively.

Each pair of weighting members and their joining strap can be integrally moulded by an injection moulding process, and when high density cores are used, these can be positioned on pins in the injection mould
20 so that they are centralised and become sheathed by the polymeric material.

Three typical weights of a pair of weighting members together with their integral strap are respectively 1.30, 3.40 and 5.15 grams. It will be
25 appreciated that when they are positioned as shown at P and Q in Fig. 1 then the effective weight added to the racket will be double these values i.e. 2.60, 6.80 and 10.30 grams. These values are significant enough to alter the balance of the racket, thereby enabling it to
30 be tailored to the requirements of a particular user.

The weighting member/strap system 4,5 can be repeatedly fitted to and removed from the recesses in the racket head 10. This allows various weight values
35 to be tried out by a customer prior to purchase, and/or allows various weight values to be used with the same racket after purchase, for example for training

purposes. In this way, as indicated at the beginning, with only one or a small number of racket frame types it is possible to satisfy the requirements of a large number of users.

- 5 Although the preferred embodiment disclosed above refers to a tennis racket, of course the present invention is equally applicable to other games rackets such as those used for badminton or squash.

CLAIMS

- 5 1. A games racket comprising:
 a frame member having a head (10) of
generally annular shape, and a plurality of weighting
members (4) detachably fitted to the head, wherein the
head is provided with mounting means (1) for the
10 weighting members at each of a plurality of
predetermined points around its circumference.
2. A games racket according to claim 1, wherein
the mounting means comprise recesses (1) moulded into a
15 portion (2) of the racket head (10) having an enlarged
section, the recesses being shaped to accommodate the
weighting members (4).
3. A games racket according to claim 1 or 2,
20 wherein the weighting members are each provided with a
projection (6) which fits into a corresponding hole (3)
in the racket head (10).
4. A games racket according to claim 3, wherein
25 the projection (6) is a stud of elastic material shaped
for locking engagement with the hole (3) in the racket
head (10).
5. A games racket according to any preceding
30 claim, wherein the racket head (10) carries a net of
strings and wherein the weighting members are fitted to
the head in pairs, the weighting members of each pair
being located at corresponding points on said head at
either side of the net of strings.
6. A games racket according to claim 5, wherein
35

the weighting members of each pair are joined together.

5 7. A games racket according to claim 6, wherein the weighting members of each pair are joined by a flexible, elastic strap (5).

 8. A games racket according to claim 7, wherein the pair of weighting members including said strap comprise an integrally-formed body.

10 9. A games racket according to claim 8, wherein the pair of weighting members including said strap are formed by injection moulding of polymeric material.

15 10. A games racket according to any preceding claim, wherein the weighting members comprise a core (7) of high density material.

20 11. A games racket according to claim 10 as appended to claim 9, wherein the core (7) is encased in the polymeric material.

 12. A games racket according to claim 10 or 11, wherein the core (7) is made of metal.

25 13. A games racket according to any preceding claim, wherein the head (10) has a crown and the games racket further comprises a shaft joined to a portion of the head opposite said crown, and wherein mounting
30 means are located at points on the head at angles of θ and $(360-\theta)$ degrees made in the plane of the strings by a radius from the centre point of the head relative to a line through the centre line of the shaft and said crown and measured from said crown, where θ has a value
35 between 20 and 60 degrees.

14. A games racket, substantially as hereinbefore described with reference to the accompanying drawings.

5 15. A weighting member for a games racket according to any of the preceding claims.

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